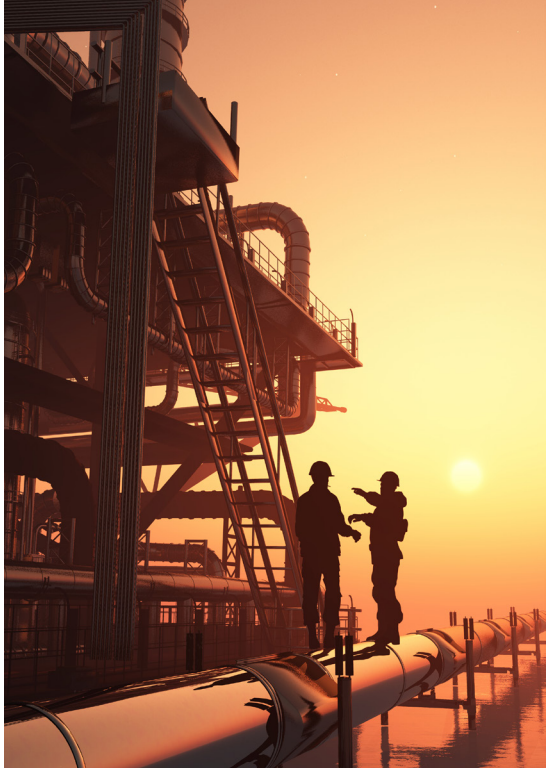
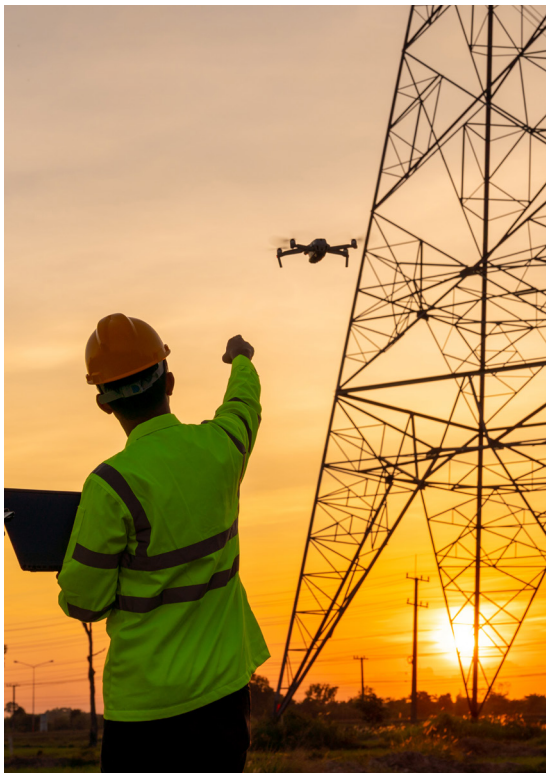




UNITED STATES ENERGY & EMPLOYMENT REPORT 2023

U.S. DEPARTMENT OF ENERGY

ENERGY.GOV/USEER


DEPARTMENT OF ENERGY
Secretary Jennifer M. Granholm

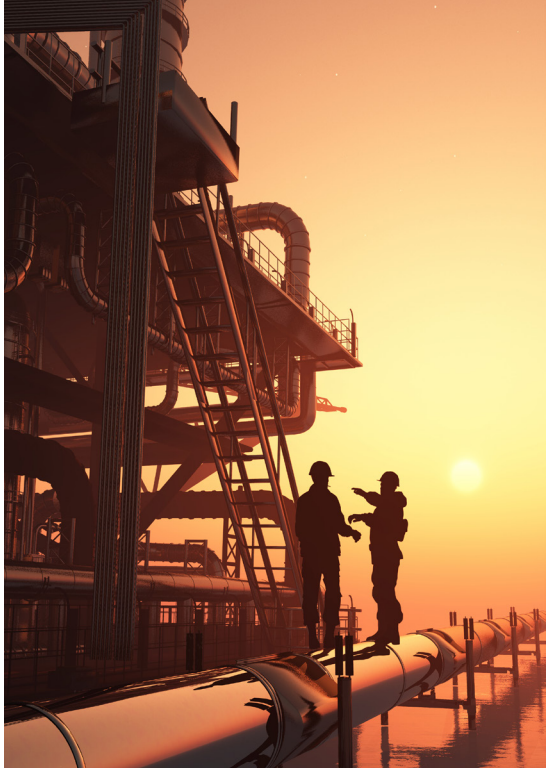
DEPARTMENT OF ENERGY
OFFICE OF ENERGY JOBS

Authorship and Acknowledgments

This report was prepared by the U.S. Department of Energy's (DOE) Office of Energy Jobs, with significant contributions from the following individuals: David Keyser, Marie Fiori, Betony Jones, Hugh Ho, Shrayas Jatkar, Kate Gordon, Gina Copland-Newfield, Carla Frisch, and Christy Veeder.

The interagency Energy Jobs Council provided valuable direction and recommendations. The Energy Jobs Council is comprised from the Department of Commerce, U.S. Census Bureau, Bureau of Labor Statistics, Energy Information Administration, Department of Energy State Energy Advisory Board, and Department of Transportation.

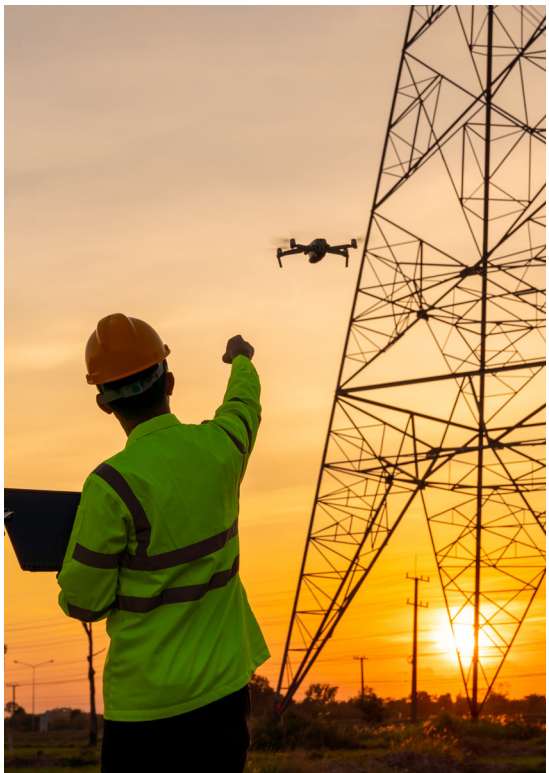
This underlying survey and data collection was provided by BW Research, funded by DOE under Award Number 89303021COP000001.


UNITED STATES ENERGY & EMPLOYMENT REPORT 2023

KEY FINDINGS

ENERGY.GOV/USEER


EXECUTIVE SUMMARY

The number of U.S. energy sector jobs grew 3.8% from 2021 to 2022, and clean energy jobs grew 3.9%, outpacing overall U.S. employment, which increased 3.1% in the same time period.[1]

The energy sector added nearly 300,000 jobs, increasing from 7.8 million total energy jobs in 2021 to more than 8.1 million in 2022. Though women are underrepresented in the U.S. energy sector, they made up more than half of the new workers in 2022.

Prior to the COVID-19 pandemic, the energy sector was one of the nation's fastest-growing job markets. From 2015 to 2019, the annual growth rate for energy employment in the U.S. was 3.0% — double the 1.5% job growth in the U.S. economy as a whole. COVID-19 and its associated economic fallout deeply impacted energy employment, with the sector losing jobs at a higher rate than the economy as a whole.[2]

As of 2022, the energy sector has recovered 71% of the jobs lost in 2020.[3] The energy sector has added back 596,000 of the 840,000 jobs lost during the first year of the pandemic, but the distribution of these jobs has shifted across technologies. For example, the number of jobs in battery storage was 11% higher than the 2019 level, while the number of jobs in advanced and recycled building materials was at 92% of its 2019 level. Employment increased across all major technology areas from 2021 to 2022.

KEY STATISTICS

- Clean energy jobs increased in every state and grew 3.9% nationally from 2021 to 2022.
- The number of jobs in battery electric vehicles increased by 28,366 (+27%) from 2021 to 2022, which was the fastest growth of any energy technology. The growth in battery electric vehicles was almost 17 times faster than the increase in gasoline and diesel vehicle employment.
- Clean vehicles accounted for 59% of all net new jobs in motor vehicles.
- Other technologies with double-digit growth include offshore wind (20%), other grid modernization (12%), coal fuel (22%), natural gas fuel (24%), petroleum (13%), hydrogen fuel cell vehicles (25%), natural gas vehicles (14%), and plug-in hybrid vehicles (10%).
- Clean energy electricity technologies, such as solar and wind, accounted for

nearly 87% of net new electric power generation jobs, adding 22,279 jobs (+3.6%).

- Employers across all technologies report they expect growth from 2022 to 2023, ranging from 1.6% in fuels to 6.4% in energy efficiency.
- The number of women working in energy increased by 149,732 (+7.8%), meaning that over half of the net jobs added in 2022 were held by women.
- Veterans made up 9% of the U.S. energy workforce, higher than their representation in the overall U.S. economy (5%).
- Union employers were more than twice as likely than non-union employers (46% and 22%, respectively), to offer or require a diversity and/or inclusion training program aimed at advocating workplace diversity and inclusion as well as more likely to report specific strategies, policies, or programs to increase the number of women, ethnic and racial minorities, and LGBTQ+ hires.[4]
- The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in the energy workforce (11%) was over 1.5 times the private sector average (7%).
- Union employers[5] reported lower difficulty finding workers than non-union employers in 2022; 48% of non-union firms reported that it was "very difficult" to find workers, while only 29% of unionized firms reported this difficulty.

INTERPRETING USEER DATA

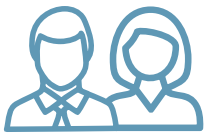
This report includes data from a snapshot in time, and current events can affect reported results. In 2022, the conflict in Ukraine had a notable impact on fuels industries, resulting in increased U.S. exports of petroleum and wet gas.[6] In addition, the number of active crude oil and natural gas rotary rigs increased by 35% between December 2021 and December 2022,[7] and establishments engaged in the fuels value chain added nearly 124,000 jobs between 2021 and 2022, a growth rate of 13.6%.

JOBS ADDED IN 2022

+300,000

IN THE ENERGY SECTOR, WHICH NOW EMPLOYS

8.1 MILLION
AMERICANS



+150,000

INCREASE IN WOMEN WORKING IN ENERGY **(+7.8% IN 2022)**

3.9%

INCREASE IN **CLEAN ENERGY JOBS**, OUTPACING GROWTH IN ENERGY JOBS OVERALL

CLEAN ENERGY JOBS

The United States has a goal to reach net-zero greenhouse gas emissions by 2050. "Net-zero emissions" refers to achieving an overall balance between greenhouse gas emissions produced, avoided, and removed from the atmosphere.[8]

In this report, "clean energy jobs" are reported at the national and state levels with slightly different definitions due to data availability. Nationally, clean energy jobs include jobs in the technologies that align with this "net-zero" future, including those related to renewable energy; grid technologies and storage; traditional electricity transmission and distribution for electricity; nuclear energy; a subset of energy efficiency that does not involve fossil fuel burning equipment; biofuels; and plug-in hybrid, battery electric, and hydrogen fuel cell vehicles and components.

In 2022, there were 3.1 million clean energy jobs meeting the net-zero aligned definition. This represents an increase of more than 114,000 since 2021, or growth of 3.9%. These jobs made up more than 40% of total energy jobs in 2022.

At the state level, USEER does not have the level of granularity to limit clean energy jobs to only those aligned with a net-zero economy, so state-level clean energy jobs include all energy efficiency jobs. In Appendix A, state-level clean energy jobs are reported including and excluding transmission and distribution jobs. Nationally, 54% of energy efficiency jobs and 69% of traditional transmission and distribution jobs were net-zero aligned, but these percentages may vary by state. If the state-level definition of clean energy jobs was applied nationally, the total number of clean energy jobs would be 9% higher (3.3 million) excluding transmission and distribution, and 40% higher (4.3 million) including transmission and distribution.

Many individual workers split time between traditional and clean energy tasks. The USEER survey classifies jobs as "clean" where workers spend more than half of their time working in clean energy technology areas.

Please note that many clean energy investments from the Infrastructure Investment and Jobs Act (the Bipartisan Infrastructure Law), Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act, and Inflation Reduction Act are initially supporting work that was likely not covered in the USEER survey. USEER data depends on employer responses to survey questions. Jobs related to the construction of supply chain facilities such as battery or clean energy component manufacturing or materials processing plants, for example, would not be reported unless the construction employers indicated that their work was primarily in an energy technology sector. Since factory construction work is not particularly specific to the technology that will eventually be produced there, it's unlikely that factory construction jobs are reflected in this year's USEER. Future USEER surveys will seek to capture and report the construction employment associated with building the facilities for clean energy supply chains.

EMPLOYMENT BY TECHNOLOGY

Every technology category in the energy sector showed growth in 2022.

		Job growth since 2020
MOTOR VEHICLES	2.6 MILLION JOBS AT THE END OF 2022	+13% SINCE 2020
ENERGY EFFICIENCY	2.2 MILLION JOBS AT THE END OF 2022	+7.4% SINCE 2020
FUELS	1.0 MILLION JOBS AT THE END OF 2022	+11% SINCE 2020
TRANSMISSION, DISTRIBUTION & STORAGE	1.4 MILLION JOBS AT THE END OF 2022	+3.8% SINCE 2020
ELECTRIC POWER GENERATION	883,300 JOBS AT THE END OF 2022	+6.1% SINCE 2020

ELECTRIC POWER GENERATION

The Electric Power Generation (EPG) sector employed

883,300

a gain of

25,700 JOBS

+3.0%

WOMEN LED EPG EMPLOYMENT GROWTH, ACCOUNTING FOR 65% OF NET JOB GAINS IN 2022

Clean energy technologies accounted for more than 84% of net new electric power generation jobs, adding 21,664 jobs. The clean energy electric power generation workforce grew by 3.6%, which was 16% faster than overall domestic economic growth.

Both solar and wind, the two largest employment sectors of electric power generation technologies, increased from 2021 to 2022, following increases from 2020 to 2021. Solar had the largest number of jobs gained, adding 12,256 workers (+3.7%). Land-based wind added 5,238 workers, for a growth rate of 4.4%. Offshore wind, although small relative to other renewable energy technologies, had the highest growth rate from 2021 to 2022 (+20.3%, or +178 jobs).

Employment in other renewable energy electric power generation technologies also grew in 2022, including traditional and low-impact hydropower employers, which added 1,758 jobs (+2.7%), bioenergy employers, which added 462 jobs (+3.7%), and geothermal employers, which added 413 jobs (+5.0%). Though the absolute number of jobs gained for some emerging renewable energy technologies, such as offshore wind and geothermal, was small, they exhibit above average rates of growth.

Nuclear electric power generation employment increased by 1,358 jobs in 2022, up 2.4% from 2021, whereas it had decreased the previous year. Employment increased and decreased across different categories of fossil energy for electric power generation. Coal electric power generation jobs decreased by 6,780 from 2021 to 2022, down 9.6%, while natural gas electric power generation[9] jobs increased by 7,311, a growth rate of 6.6%. Oil electric power generation employment increased by 2.4%, adding 279 jobs in 2022.

TRANSMISSION, DISTRIBUTION AND STORAGE

Transmission, Distribution, and Storage (TDS) employed

1.4 MILLION

a gain of

29,900 JOBS

+2.2%

TRADITIONAL TDS ADDED THE MOST JOBS (17,700) AND GREW 1.9% IN 2022

Other grid modernization[10] outpaced virtually all other transmission, distribution, and storage technologies in growth rate, increasing 11.6% (2,157 jobs). Batteries, for both grid storage and electric vehicles, added 3,225 jobs (+4.6%).

In 2022, battery manufacturing represented 16% of all storage jobs (11,667 jobs), up from 14% in 2021.

Battery storage manufacturers in transmission, distribution, and storage produce batteries for multiple applications; consumer devices, vehicles or other transportation (including electric vehicles), behind-the-meter (buildings or industrial facilities), and front-of-meter (electric grid).

ENERGY EFFICIENCY

The Energy Efficiency sector employed

2.2 MILLION

a gain of

50,500 JOBS

+2.3%

FIRMS UNDERWENT POSITIVE JOB GROWTH IN ALL EFFICIENCY TECHNOLOGIES

Energy efficiency was hit especially hard by the COVID-19 pandemic in 2020, resulting in across-the-board declines amounting to a loss of 271,719 jobs. Since 2020, energy efficiency employers have added 163,461 workers, recovering 60.2% of the total lost during the pandemic. Energy efficiency grew more slowly in 2022 than the energy sector as a whole (2.3% versus 3.8%). The energy efficiency sector remained one of the largest energy technology sectors, with over 2.2 million workers.[11]

TRADITIONAL HVAC

Traditional HVAC firms added the highest number of jobs:

+2.8%

a gain of

15,118 JOBS

FUELS

The Fuels sector employed

1.0 MILLION

a gain of

123,400 JOBS

+13.6%

FUELS EMPLOYERS ADDED THE MOST JOBS IN 2022 AMONG ALL ENERGY CATEGORIES

PETROLEUM & NATURAL GAS

Petroleum fuels saw the largest increase in employment in this sector, followed by natural gas fuels

PETROLEUM JOBS

+12.5%

a gain of

58,100 JOBS

NATURAL GAS JOBS

+24.1%

a gain of

51,100 JOBS

Most of growth was within the mining and extraction industry, which added 107,029 jobs over the year.

Biofuels employment, including corn ethanol, renewable diesel fuels, biodiesel fuels, and waste fuels, grew by 1.7%, adding 1,878 jobs.

Fuels employment remained 117,094 jobs below the total reported in 2019.

MOTOR VEHICLES AND COMPONENT PARTS

Motor Vehicles (including component parts) employed

2.6 MILLION

+2.7%

a gain of nearly

65,000 JOBS

MOTOR VEHICLES AND COMPONENT PARTS IS THE LARGEST ENERGY TECHNOLOGY AREA

CLEAN ENERGY VEHICLES

Jobs in clean energy vehicles increased 38,232 from 2021 to 2022 (182,526 to 220,759).

+20.9%

+38,200 JOBS

BATTERY ELECTRIC VEHICLES

Jobs in battery electric vehicles (BEV) grew by 28,366 (+27%). The growth in BEVs was almost 17% faster than the increase in gasoline and diesel vehicle employment.

+26.8%

+28,400 JOBS

HYBRID ELECTRIC VEHICLES

Employment in the **hybrid EV** workforce grew by 6.6 percent (9,500 jobs).

+6.6%

+9,500 JOBS

Hydrogen/fuel cell vehicles employers added a smaller number of jobs from 2021 to 2022 (+3,573) but grew by more than a quarter (+25%).

Motor vehicles recovered the jobs lost from 2019 to 2020 and in 2022 had approximately 61,700 more workers than in 2019.

THE INVEST IN AMERICA ENERGY INVESTMENTS

In November 2021, the Infrastructure Investment and Jobs Act (the Bipartisan Infrastructure Law) (Pub. L. 117-58) was signed into law. The $1.2 trillion infrastructure law allocates more than $75 billion to clean energy, including $7.5 billion for EV charging infrastructure and $62 billion for the DOE to revitalize domestic supply chains and strengthen America's manufacturing leadership; expand access to energy efficiency and clean energy for families, communities, and businesses; deliver reliable, clean, and affordable power to more Americans; and build the technologies of tomorrow through clean energy demonstrations.

In August 2022, the Inflation Reduction Act (IRA) (Pub. L. 117-169) was enacted, investing approximately $370 billion in clean energy and climate over 10 years. In addition to a broad portfolio of tax credits that will incentivize the creation and deployment of thousands of new clean energy projects across the country, IRA funding includes $2.0 billion for the domestic production of advanced vehicles, $5.8 billion to reduce industrial emissions, $9.0 billion for states to provide home retrofit and energy efficiency consumer rebates, $27 billion to the Greenhouse Gas Reduction Fund, and $40 billion in new loan authority to guarantee loans for innovative clean energy projects.

Also in 2022, the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act (Pub. L. 117-167) was signed into law, authorizing historic levels of funding to support the production of semiconductors and other strategic technologies, including $67 billion to the DOE to enable cutting-edge research and development in clean energy, improve infrastructure at the National Labs, and support investments in innovation and technology hubs across the country.

Together, these Invest in America laws provide the funding needed to modernize America's electrical grid, revitalize our manufacturing capabilities, strengthen pathways for STEM careers, and expand access to clean energy, all while addressing legacy pollution, creating quality jobs, and building healthier communities.

Many projects funded under these laws are still in the design and planning phases, and the full job creation of these investments will likely show up in future surveys.

INDUSTRY DATA

Within each technology sector, this report accounts for employment across different industries (see **Figure 2** below). The changes in energy jobs in each technology sector is reported by industry in **Table 1**. Mining and extraction firms added the most jobs among industry categories, due to job growth in mining and extraction of fuels. Construction industry jobs grew the second most among industry categories, with the majority of new workers employed within energy efficiency. All the technology sectors added jobs in the manufacturing; wholesale trade, distribution, and transport; professional and business services; and "other services" industries.

Figure 2. Energy Employment by Technology Category and Industry, 2022

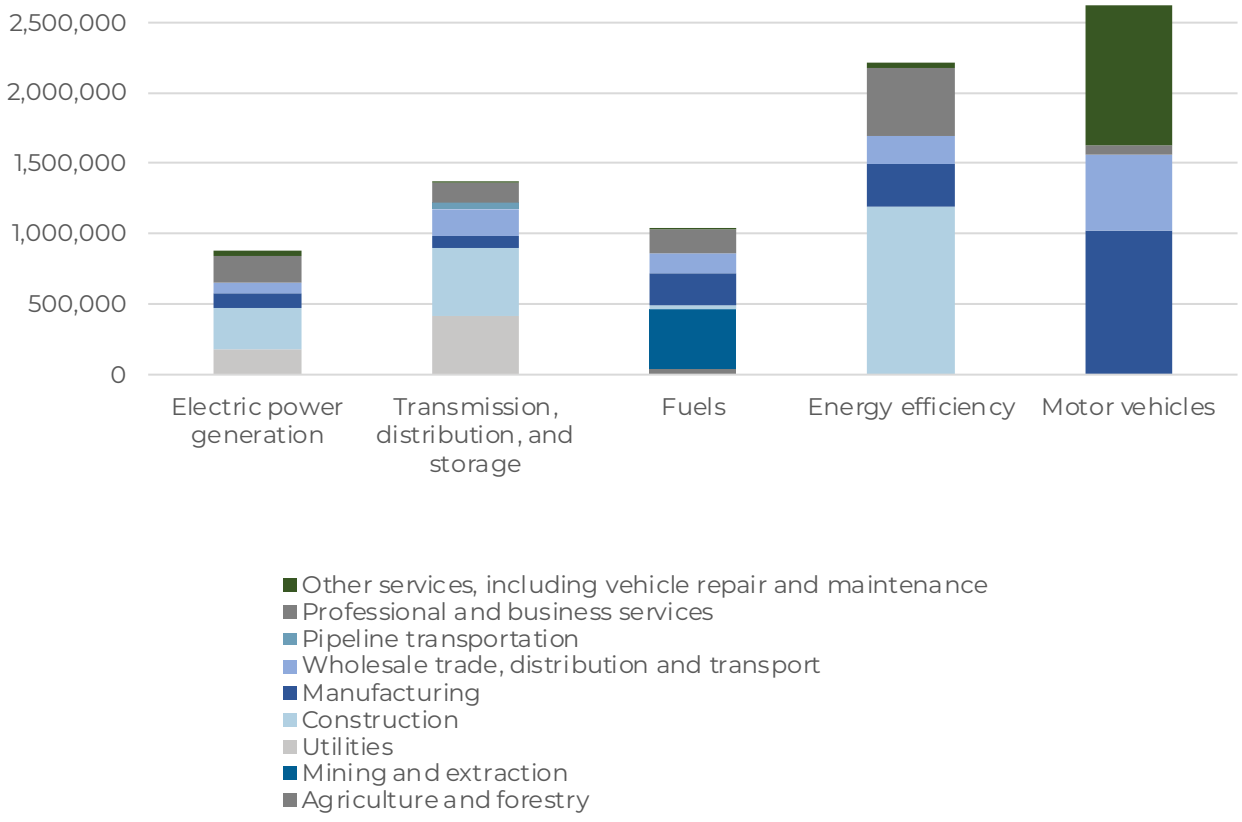


TABLE 1. Change in Energy Jobs by Industry, 2021-22

	Electric Power Generation	Transmission, Distribution, and Storage	Fuels	Energy Efficiency	Motor Vehicles	Industry Total
Agriculture and Forestry	0	0	82	0	0	82
Mining and Extraction	0	0	107,029	0	0	107,029
Utilities	5,142	5,866	0	0	0	11,008
Construction	6,660	13,989	885	23,729	0	45,263
Manufacturing	2,193	2,862	4,266	6,022	16,354	31,697
Wholesale Trade, Distribution, and Transport	2,276	2,069	3,362	8,213	19,489	35,409
Pipeline Transportation[12]	0	-181	0	0	0	-181
Professional and Business Services	8,015	5,047	7,689	11,504	1,092	33,347
Other Services	1,397	284	64	1,049	27,938	30,732
Total change from 2021	**25,683**	**29,936**	**123,377**	**50,517**	**64,873**	**294,386**

2022 DEMOGRAPHIC INFORMATION AND DIVERSITY

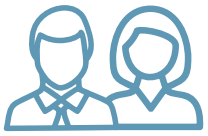
As with other data in this report and in previous USEER reports, demographic information and diversity data was collected from surveys with employers and augmented by data from BLS, QCEW, and EIA. Depending on the employer's source of data, the demographic data (particularly for the race and ethnicity or workers) reported by employers could vary from the race and ethnicity individuals would report for themselves. A summary of the demographics of the U.S. energy workforce is in **Table 2**.

- The energy workforce was 73% dominated by men, making it less balanced in terms of gender than the U.S. workforce average, which was 53% male. Women made up 26% of the energy workforce, much less than the U.S. average, which was 47%.[13] Gender nonbinary workers made up <1% of the energy workforce, but there are insufficient data to compare this to the U.S. workforce overall.

- Women remained underrepresented in the energy workforce (26% compared to 47% in overall workforce), but their participation in the workforce has grown. The number of women in energy increased by 151,000 (+7.8%), meaning that over half of the jobs added in 2022 were held by women. The representation of

women was highest in electric power generation across the different technologies sectors, where they made up 32% of the workforce.

- American Indian or Alaska Native workers made up 2% of the energy workforce, which was more than twice as high as the U.S. workforce average, which was less than 1%.
- There was a slightly higher percentage of non-white workers in energy, 24% compared to 23% of the entire U.S. workforce. However, the energy workforce had a lower-than-average percentage of Black or African American workers. In no technology were Black or African American workers represented proportionally to their representation in the overall U.S. workforce. Transmission, distribution, and storage had the highest representation of Black or African American workers, at 11% compared to the national average of 13%.[14]



WOMEN COMPRISED

26%

OF THE ENERGY WORKFORCE

(COMPARED TO 47% OF OVERALL WORKFORCE)

50.3%

OF THE NET NEW ENERGY JOBS IN 2022 WERE HELD BY WOMEN

- The proportion of Hispanic or Latino workers in energy (18%) was just below the national average of 19%.
- The percentage of Asian workers in energy was the same as the national workforce average, at 7%.
- The percentage of non-white workers in transmission, distribution, and storage was higher than the energy workforce average (30% compared to 25%). This was attributable to Asian workers (9% compared to 7%), Black or African American workers (11% compared to 9%), and American Indian or Alaska Native workers (3% compared to 2%) being more represented in transmission, distribution, and storage than in the overall energy workforce.
- Union employers were more than twice as likely than non-union employers (46% and 22%, respectively), to offer or require a diversity and/or inclusion training program aimed at advocating workplace diversity and inclusion as well as more likely to report specific strategies, policies, or programs to increase the number of women, ethnic and racial minorities, and LGBTQ+ hires.
- Individuals requesting accommodations for disabilities were underrepresented in the energy workforce (2% compared to 4% in the overall U.S. economy). Individuals requesting accommodations for disabilities worked in transmission, distribution, and storage at a higher rate (3%) than

TABLE 2. United States Energy Workforce Demographics and Characteristics[15]

	Number of Workers	Energy Workforce Average	National Workforce Average
Male	5,757,198	73%	53%
Female	2,065,291	26%	47%
Gender Nonbinary	42,810	<1%	insufficient data
Hispanic or Latino	1,410,187	18%	19%
Not Hispanic or Latino	6,455,112	82%	82%
American Indian or Alaska Native	169,238	2%	<1%
Asian	531,464	7%	7%
Black or African American	721,120	9%	13%
Native Hawaiian or Other Pacific Islander	81,827	1%	<1%
White	5,889,528	75%	77%
Two or More Races	395,173	5%	3%
Unknown Race	76,949	<1%	insufficient data
Veterans	709,961	9%	5%
18 to 29	2,334,990	30%	22%
30 to 54	4,172,277	53%	54%
55 and Over	1,358,033	17%	24%
Disability	180,538	2%	4%
Formerly Incarcerated	96,950	1%	2%
Represented by Unions, Collective Bargaining Agreements, and/or Project Labor Agreements	849,959	11%[16]	7%

National sources: BLS (2023a, 2023b, 2023c, 2023d), Jobs EQ (2022), Prison Policy (2022)

the energy workforce average.

- While 2% of the workforce was formerly incarcerated, these individuals made up only 1% of the energy workforce.
- Veterans made up 9% of the U.S. energy workforce, higher than their representation in the overall U.S. economy (5%). Veterans made up 10% of the motor vehicles and fuels sectors. The energy workforce was younger than the U.S. workforce as a whole. Eighty-three percent of the energy workforce was younger than 55 compared to the national workforce average of 76% (Table 2). Both coal fuels and corn ethanol fuels employed workers aged 55 and older at close to the national workforce average (23% versus 24%). Just over one-fifth (21%) of motor vehicles and component parts workers were aged 55 and older.

UNION MEMBERSHIP

The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in the energy workforce (11%) was over 50% higher than the private sector average (7%), although there was considerable geographic variability. The percentage of workers represented by a union or covered under a project labor or collective bargaining agreement in transmission, distribution, and storage (18%) was considerably higher than the overall energy workforce average (11%). Across all energy technologies covered in this report, nuclear electric power generation had the highest unionization rate in 2022, at 19%.

Union shops were more likely than non-union shops to have policies about recruiting from communities of color or women:

UNION SHOPS WERE

50%

more likely to have a policy to recruit women

2x

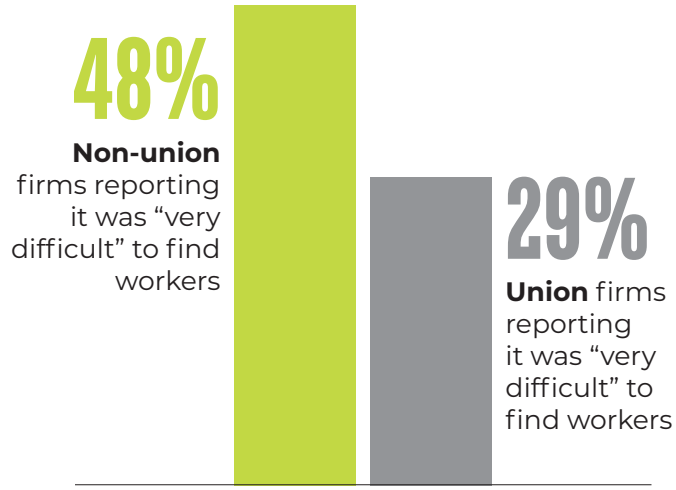
more likely to have a policy to recruit persons of color

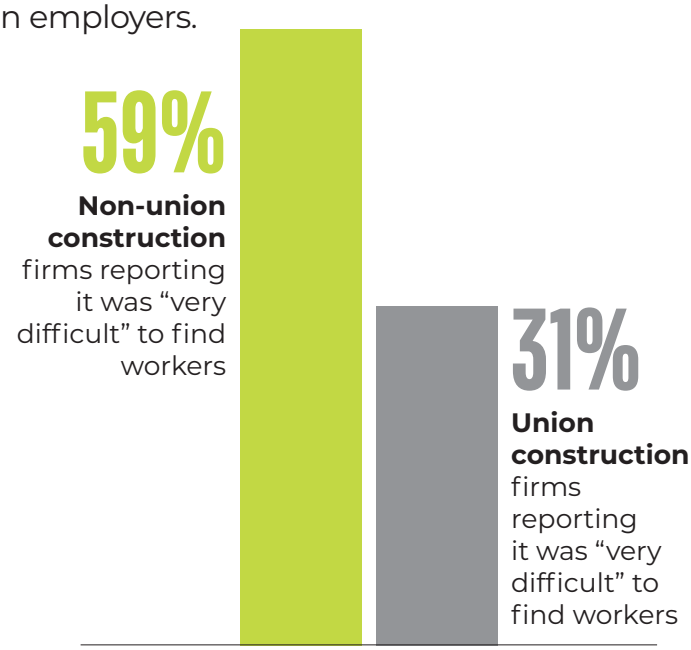
2.5x

more likely to have a policy to recruit LGBTQ+

UNIONIZATION & ENERGY JOBS

Union employers reported lower difficulty finding workers than non-union employers in 2022, with 29% of union and 48% of non-union firms reporting that it was "very difficult" to find workers. This difference was especially pronounced in the construction industry, where 31% of union construction employers reported that it was "very difficult" to find workers, compared to almost double the percentage (59%) of non-union employers.

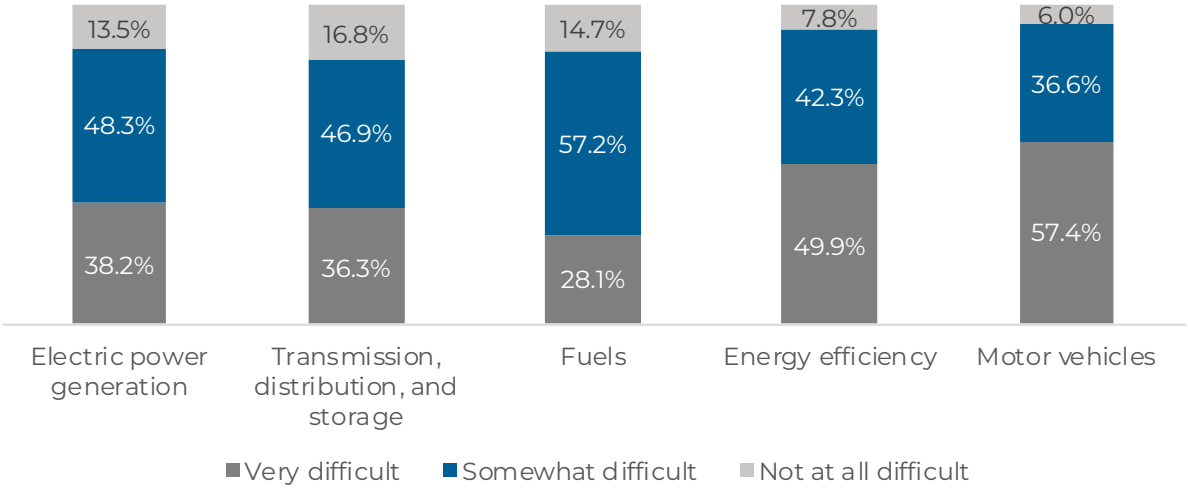




EMPLOYER PERSPECTIVE ON WORKFORCE ISSUES

When asked about their experience "finding qualified workers," more than four out of five employers across energy technologies reported at least "some difficulty." Motor vehicles (94.0%) and energy efficiency (92.2%) employers reported the highest overall difficulty among all technologies. More than half (57.4%) of all motor vehicles employers indicated that finding qualified workers was "very difficult" in 2022 **(See Figure 3)**

Figure 3. Hiring Difficulty by Technology



Union employers[17] reported lower difficulty finding workers than non-union employers in 2022, with 29% of union and 48% of non-union firms reporting that it was "very difficult" to find workers. This difference was especially pronounced in the construction industry, where 31% of union construction employers reported that it was "very difficult" to find workers, compared to almost double the percentage (59%) of non-union employers.

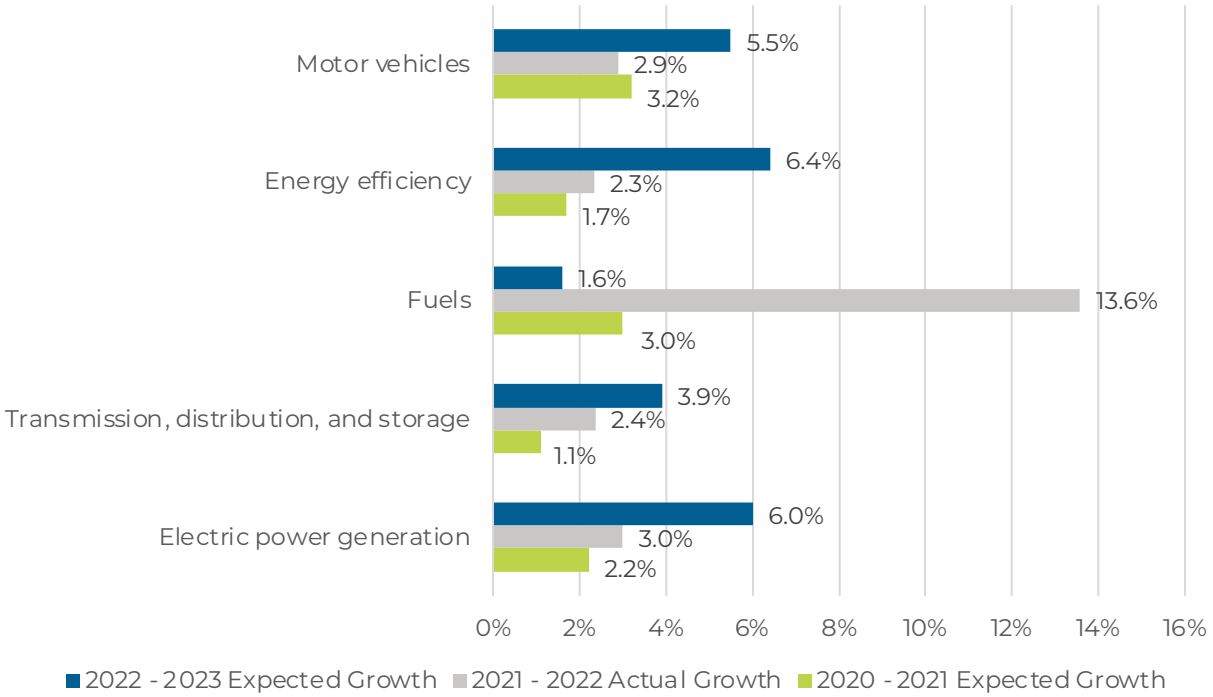
One explanation for union employers' relative ease of hiring is that unionized workforces often partner with and support registered apprenticeship programs. Registered apprenticeship programs and other labor-management training programs can provide employers with a reliable source of well-trained workers.

Publication Number: DOE/OP-0020

Surveyed companies in all energy technologies reported that they expect job growth from 2022 to 2023 (Figure 4). This was led by energy efficiency (+6.4% growth expected by employers), followed by electric power generation (+6.0%), motor vehicles (+5.5%), transmission, distribution, and storage (+3.9%), and fuels (+1.6%). Except for motor vehicles and fuels, estimated energy sector employment growth was significantly higher in 2022 than in 2021.

.

Figure 4. Anticipated and Actual Change in Employment by Technology



Past surveys show that employers' expectations are unreliable indicators of the magnitude and direction of such changes. Figure 4 illustrates the actual employment change by technology from 2021 to 2022 compared to employer expectations from the 2021 USEER. Employment in most technology areas grew more than expected. Fuels employers expected to increase employment by 3.0% while actual growth was nearly 14%, mostly owing to the expansion of employment in the fuels mining and extraction industry.

KEY STATE TAKEAWAYS

In addition to this national report, USEER data are collected at the state level in a companion report, which includes a brief energy and employment profile for each state and the District of Columbia. The state report includes a high-level snapshot of employment in electric power generation, transmission, distribution, and storage, fuels, energy efficiency, and motor vehicles and component parts, as well as breakdowns by technology application and industry. Highlights are provided below. For more information, view the state-level report at energy.gov/useer.

- Energy jobs grew in all 50 states and Washington, D.C., with the largest growth in Texas, California, and Pennsylvania.
- Clean energy jobs grew across all 50 states and D.C. Excluding traditional transmission and distribution, California added 13,116 jobs (+3.6%), followed by Texas, which added 5,198 (+5.5%), and New York, which added 5,054 (+3.0%). When including transmission and distribution jobs, California added 13,293 (+3.2%), followed by West Virginia, which added 6,975 (+19%), and Texas, which added 5,136 (+3.5%).
- The top four states with the highest percentage growth in energy efficiency included Nevada (+6.7%, 769 jobs), New Mexico (+6.1%, 347 jobs), Oklahoma (+5.4%, 727 jobs), and New Jersey (+5.1%, 1,748 jobs).
- Although every state and Washington, D.C. increased overall energy jobs from 2021 to 2022, several states lost a significant amount of employment in different technology areas, including Indiana (-0.8% in motor vehicles and component parts, -1,520 jobs), Wisconsin (-0.9% in energy efficiency, -505 jobs), and Ohio (-1.1% in electric power generation, -291 jobs).
- The highest percentage growth in transmission, distribution, and storage jobs occurred in West Virginia (+20%, 6,579 jobs), Oklahoma (+9.9%, 3,043 jobs), and Pennsylvania (+9.8%, 4,606 jobs).

STATES ADDING MOST JOBS

50,200
TEXAS

21,200
CALIFORNIA

15,200
PENNSYLVANIA

- Employment in electric power generation grew fastest in Delaware (+14%, 184 jobs), followed by Idaho (+12%, 303 jobs), the District of Columbia (+11%, 291 jobs), and Montana (+9.6%, 139 jobs).
- The top four states with the highest percentage growth in fuels jobs were North Dakota (+31%, 7,786 jobs), West Virginia (+28%, 5,933 jobs), New Mexico (+26%, 6,078 jobs), and Wyoming (+21%, 3,855 jobs).
- Growth in motor vehicles and component parts jobs was spread across many states, led by Florida (+6.5%, 6,430 jobs), Hawaii (+6.0%, 217 jobs), Arizona (+5.8%, 2,086 jobs), and California (+5.3%, 11,435 jobs).

CONCLUSION

Energy employment in the United States continued to outpace economy-wide employment, growing by 3.8% compared to 3.1% between 2021 and 2022. Clean energy employment outpaced the energy sector average, growing 3.9%. The energy sector has recouped 71% of the number of jobs lost in 2020 during the COVID-19 pandemic. The percentage of women in the energy workforce increased by 149,732 workers representing a 7.8% increase in 2022, and increasing female participation from 25% to 26% of the energy workforce. Unionized employers report less difficulty in having skilled workers and are much more likely to have formal diversity, equity, inclusion, and access programs.

The fuels sector saw the largest percent increase from 2021 to 2022, with the fastest growth seen in onshore natural gas. The second largest percent increase was in electric power generation jobs. Among states, Texas added the most energy jobs (50,197) from 2021 to 2022, followed by California (21,198), and Pennsylvania (15,162). Clean energy jobs increased in all 50 states plus Washington, DC.

[1] Bureau of Labor Statistics (BLS) Current Employment Statistics (CES) December 2021 to December 2022 total employment, not seasonally adjusted

[2] This may be explained by a decrease in energy use during the pandemic, although this report does not ask employers reasons for changes in employment. For more information about energy use during the pandemic see Pandemic drives down U.S. energy use in 2020 | Lawrence Livermore National Laboratory (llnl.gov).

[3] The economy as a whole surpassed 2019 employment levels in 2022.

[4] Question was asked for each demographic group. Union employers were between 43%-150% more likely to have such programs or policies versus non-union employers.

[5] For this analysis, a union employer is defined as one with at least 20% of its workforce as a member of a labor union or covered by either a project labor agreement or a collective bargaining agreement.

[6] U.S. Energy Information Administration, U.S. Exports of Crude Oil and Petroleum Products, high of 10.2 million barrels exported in December 2022

[7] U.S. Energy Information Administration, U.S. Crude Oil and Natural Gas Rotary Rigs in Operation, 579 in December 2021 and 780 in December 2022.

[8] https://www.sustainability.gov/pdfs/net-zero-declaration.pdf

[9] Includes traditional natural gas generation and advanced natural gas generation (combined cycle, etc.)

[10] Defined as other modernization of the nation's electricity transmission and distribution system (that is not part of any other technology category in transmission, distribution, and storage) to maintain a reliable and secure electricity infrastructure that can meet future demand growth.

[11] Within EE, construction of new energy efficient buildings would only count as energy jobs if they contained ENERGY STAR components.

[12] This does not include pipeline construction. Pipeline construction falls under the NAICS 23712 code, which is construction.

[13] Percentages do not sum to 100% due to rounding.

[14] The 2023 USEER combines last year's report categories of "Black or African American" and "Black, Indigenous" back into the single category of "Black or African American." The 2023 USEER also includes an updated methodology for capturing "Two or More Races" and includes the new category of "Unknown Race."

[15] For more information about the definition of different demographics categories and how the questions are framed see Appendix B.

[16] Unionization rates vary by state.

[17] For this analysis, a union employer is defined as one with at least 20% of its workforce as a member of a labor union or covered by either a project labor agreement or a collective bargaining agreement.

OVERVIEW

The U.S. energy system is rapidly transforming, driven by policies that expand production, foster innovation, support domestic manufacturing, and create high wage jobs across America, while substantially reducing emissions. Landmark investments from the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) provide critical funding to drive more rapid adoption of zero emissions products, incentivize expanded domestic manufacturing capacity, and facilitate the development of next-generation technologies through programs that emphasize equity and a just transition.

The pace of change in the energy sector makes tracking energy employment more important than ever, but it also increases its complexity. The diversity and breadth of energy industries across the United States create significant challenges for economic modeling and traditional labor market data collection. While many of its segments, such as utility-scale power generation, fossil fuel extraction, and electric and gas transmission and distribution, are inarguably part of the energy sector, other activities (such as storage technologies and energy efficiency products and services) are difficult to define and isolate from other sectors of the economy. Given the complex relationship between energy and the overall economy, the 2023 U.S. Energy Employment Report (USEER) investigates, with a special supplemental survey, Traditional Energy sectors — Electric Power Generation, Fuels, and Transmission, Distribution, and Storage — followed by individual analyses of employment in two important energy end-use sectors — Energy Efficiency and Motor Vehicles.

Employment data collected by the BLS provide information on many, but not all, energy-related job categories. Most notably, BLS does not collect data on employment levels by energy technology across business segments. For instance, residential solar installation establishments are typically labeled as electrical contractors (together with all other traditional electrical businesses) without being identified specifically as solar companies. Petroleum-engineering firms are included in engineering services, with civil, mechanical, and other engineers, while electric vehicle manufacturers are combined with gasoline and diesel-fueled vehicle manufacturing. As a result, BLS employment data does not capture the full scope of energy employment trends.

The spread of business activities within each of the analyzed sectors presents additional taxonomic challenges, as early-stage research and development, repair and maintenance, or professional and technical services vary across energy, energy efficiency, and manufacturing. Natural gas business activities, for instance, differ from business activities relating to advanced building materials and solar photovoltaic (PV) materials..

The 2023 USEER relies on a comprehensive survey of approximately 34,000 business representatives across the United States, conducted by BW Research Partnership on behalf of the Department of Energy. The survey data are used to filter and analyze the concentration, intensity, and distribution of various energy technologies and activities throughout traditional industry sectors, using third-quarter 2022 employment data from the BLS QCEW and the BLS Unemployment Situation Table B-1 monthly reports through December 2022. USEER data also provides an additional layer of information to track sector-specific growth potential, obstacles, and opportunities. The data presented in the USEER are not intended to remove, replace, or replicate existing data from the BLS QCEW, but instead to reorganize categories and provide insight for policymakers and the public regarding trends in energy employment, energy production, and energy consumption across the United States.

For the USEER survey, a Qualifying Firm is—

An organization with employees in the United States that is directly involved with researching, developing, producing, manufacturing, distributing, selling, implementing, installing, or repairing components, goods or services related to Electric Power Generation; Electric Power Transmission, Distribution, and Storage; Energy Efficiency, including Heating, Cooling and Building Envelope; Fuels, including Extraction, Processing, Production, and Distribution; and Transportation, including Motor Vehicles. This also includes supporting services such as consulting, finance, tax, and legal services related to energy, fuels, energy efficiency, or motor vehicles.

Qualifying Workers are—

Employees of a qualifying firm that spend some portion of their time supporting the qualifying energy, energy-efficiency, or motor vehicle portion of the business.[1]

This report provides detail into levels of employment activity that include both "a portion of their time" and "a majority of their time" when referencing qualifying workers. This is especially true within the Energy Efficiency sector where the employing construction or repair firms are frequently engaged in both traditional energy-related construction or installation as well as in high-efficiency activities that qualify for ENERGY STAR designation.

HOW TO USE THIS REPORT

The 2023 USEER relies on a survey of 34,200 business representatives to analyze existing data from the BLS with technology and value-chain definitions that reflect the activities of the DOE. The survey is conducted using a stratified sampling method (which relies on survey quotas based on specific characteristics of companies, to ensure representation). BW Research uses three characteristics in this sampling plan: (1) NAICS industry, (2) state location, and (3) company size.

Using the NAICS framework and building the sample frame using establishment totals from the QCEW allows for more accurate and efficient data collection and analysis. Further, it accommodates changes in business models. If a utility, for example, outsources a portion of its activities to a construction firm, USEER's methodology allows for those jobs to continue to be counted and tracked.

At the same time, employment is allocated based on NAICS industries only. In the utility-outsourcing example used above, the USEER would still count the jobs as energy employment, but would allocate those jobs to construction rather than utilities. Because the supplemental survey captures employment across a wide range of activities and industries, the report includes more than a million jobs that would not otherwise be identified as part of the Traditional Energy sectors.

The USEER relies primarily on data from public sources as well as the comprehensive employer survey. As a result, it includes some data limitations, including statistical margin of error. The overall margin of error for identifying Qualifying Firms is +/- 0.53% at a 95% confidence interval. The margin of error for the number of Qualifying Workers sector wide is +/- 1.15% at a 95% confidence interval.[2] Data included in this report represent an estimate with a range based on the specific margin of error. For more detail, please see Appendix B, Methodology.

The 2023 USEER is organized into six chapters. The first three chapters — representing Electric Power Generation, Transmission, Distribution, and Storage, and Fuels — describe Traditional Energy jobs, from fuel extraction to processing, generation, transmission, and distribution. These chapters include fossil, nuclear, and renewable energy sources and their value chains. The report also includes two sectors selected for their importance to energy demand: Energy Efficiency and Motor Vehicles. Finally, the report includes a chapter that addresses technologies that cut across multiple chapters, such as natural gas, which has employment in Electric Power Generation, Transmission, Distribution, and Storage, and Fuels.

Within each chapter of this report, data are reported across three distinct lenses, by technology, industry, and occupation. The first lens, technology, can be used to understand changes of specific products and services over time. Viewing employment through this lens can therefore illustrate relative changes in employment among different generation technologies, such as solar, wind, coal, natural gas, etc. These changes in employment can then be analyzed in the context of changes in the energy mix over the same period.

Viewing data through the second lens, industry, allows for deeper understanding of changes within the energy value chain and can be useful for developing industrial and economic policy for the sector. Viewing data through this lens depicts changes in economic sectors, such as construction, manufacturing, professional services, etc. These changes can be further analyzed and understood in the context of broad, macroeconomic trends over the same period.

Finally, viewing the data through the third lens, occupation, allows for a deeper exploration of workforce availability and needs. Organizing data by occupation provides key detail on the types of opportunities that are growing and declining and can provide a framework for empirically driven workforce development. By filtering the same data through each lens, this report provides critical detail to a wide range of stakeholders.

[1] Data presented in this report exclude retail employees. Qualifying Workers in energy will be referenced as energy-related jobs. Where "portion of their time" includes employees whose activities are less than 50 percent of their time, specific reference will be made of that fact.

[2] For a number of detailed NAICS, data on establishments and employment are directly included in the total. Therefore, these margins represent an overstatement of potential error. It is also important to note that the margin of error increases for each subgroup of participants that participated in the survey. For example, the margin of error for questions answered by all firms that identified as "solar photovoltaic" is +/- 3.49% at a 95% confidence interval.